



USER MANUAL

Multiple Sclerosis Patient Application

Telemedicine Final Project – December 2024

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1. General Information

1.1 Application overview

The application, Multiple Sclerosis Patient, is designed to help patients with this condition maintain a clear and continuous record of health data and, therefore, monitor their disease. This is achieved by allowing patients to record ECG (Electrocardiogram) and EMG (Electromyogram) signals using a BITalino device, along with documenting their symptoms.

All information submitted by the patients is securely stored in a database managed by the server. Doctors have access to a dedicated application that enables them to review their patients' health records, analyze the data, and send feedback messages, ensuring continuous communication with their patients.

2. Application features

2.2 Server Connection

Once the application is launched, the panel shown in Figure 1 is displayed.

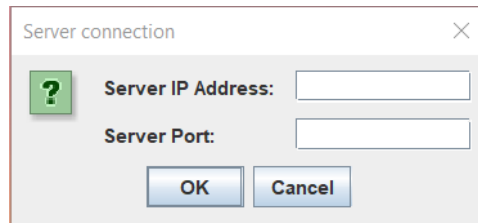
A dialog box titled "Server connection" with a close button (X) in the top right corner. On the left, there is a green square icon with a white question mark. To the right of the icon, there are two labels: "Server IP Address:" and "Server Port:", each followed by a text input field. At the bottom of the dialog, there are two buttons: "OK" and "Cancel".

Figure 1. Server Connection

The user must enter a valid *Server IP Address* and *Server Port*. Currently the server port is 9000 but could change and the IP address will depend on the IP of the server.

If both the server IP address and the server port are correct, then a connection is established, and the panel from Figure 2 will be displayed. Otherwise, a different panel will be displayed depending on the error, see Figure 3 and Figure 4.

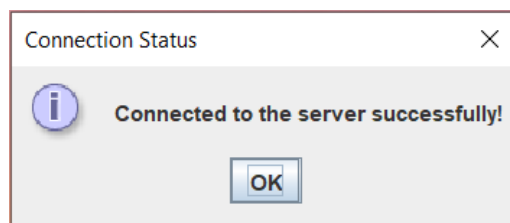
A dialog box titled "Connection Status" with a close button (X) in the top right corner. On the left, there is a blue circular icon with a white lowercase 'i'. To the right of the icon, the text "Connected to the server successfully!" is displayed. At the bottom center of the dialog, there is an "OK" button.

Figure 2. Successful connection

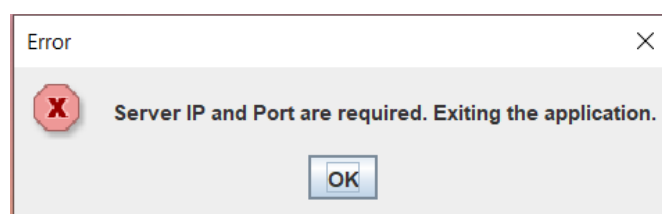
A dialog box titled "Error" with a close button (X) in the top right corner. On the left, there is a red octagonal icon with a white 'X'. To the right of the icon, the text "Server IP and Port are required. Exiting the application." is displayed. At the bottom center of the dialog, there is an "OK" button.

Figure 3. Error – Empty fields

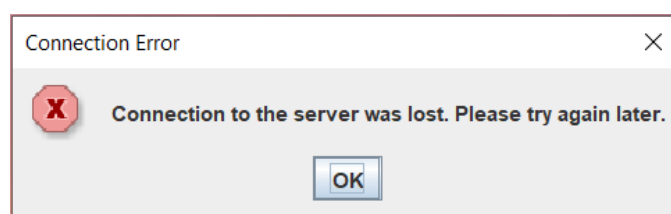
A dialog box titled "Connection Error" with a close button (X) in the top right corner. On the left, there is a red octagonal icon with a white 'X'. To the right of the icon, the text "Connection to the server was lost. Please try again later." is displayed. At the bottom center of the dialog, there is an "OK" button.

Figure 4. Server Connection Error - Connection lost

2.3 Home Screen

Once a connection has been successfully established, the home screen will be displayed, offering two main options: Sign Up and Log In.

The user must click on the "Sign Up" button if they do not have an account and wish to create one.

Alternatively, the user must click on the "Log In" button if they already have an account and wish to access it.

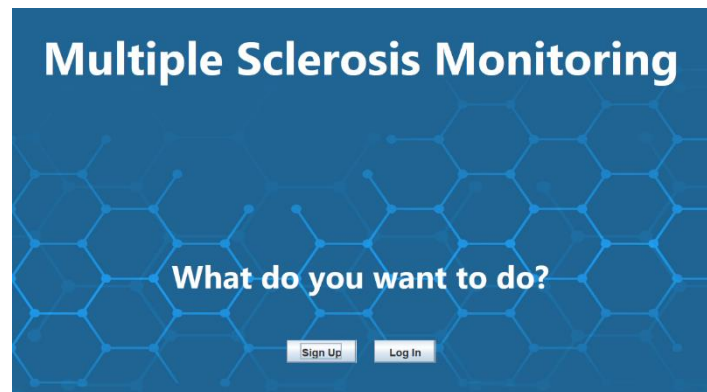


Figure 5. Home Screen

2.3.1 Sign up

To sign up and create an account in the app, the user must fill out the form displayed on the screen with accurate information (full name, surname, NIF, date of birth, phone number, gender, username, and password). To see how that data should be entered, the cursor must be placed on top of the white boxes.

Name:	<input type="text"/>
Surname:	<input type="text" value="Enter your full first name. Example: John"/>
Surname:	<input type="text"/>
NIF:	<input type="text" value="Enter your last name. Example: Doe"/>
NIF:	<input type="text"/>
Date of Birth:	<input type="text" value="Enter a valid NIF including the letter. Example: 12345678A"/>
Date of Birth:	<input type="text"/>
Phone:	<input type="text" value="Enter your birth date in dd/MM/yyyy format. Example: 10/10/2003"/>

Username:

Password: Enter a unique username. Example: johndoe@gmail.com

Password: Enter a strong password with at least 8 characters, including uppercase, lowercase, and a number.

Once the details are completed, click OK to finalize the registration.

Sign Up

Name:

Surname:

NIF:

Date of Birth:

Phone:

Gender:

Username:

Password:

Success

Registration successful!

Figure 6. Sign Up

All fields must be filled out as the pattern is expected, otherwise an alert will pop up on the screen to let the user know.

Error

Error during registration. The name field cannot be empty.

Figure 7. Empty Field Alert

Error

Error during registration: Invalid username.
It must be in the format: example@domain.com, using only letters, numbers, periods (.), underscores (_), plus signs (+), or hyphens (-).

Figure 8. Not Valid Username Alert

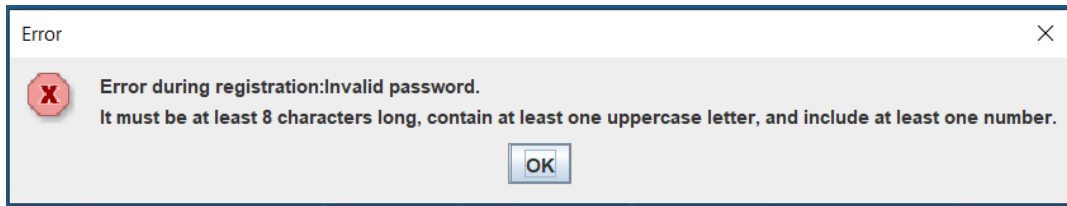


Figure 9. Not Valid Password Alert

2.3.2 Log in

The patients who have already registered and have an account on the application can log in by selecting Log In from the home screen, entering their registered username and password, and clicking OK. If incorrect credentials are entered, an error message will appear.

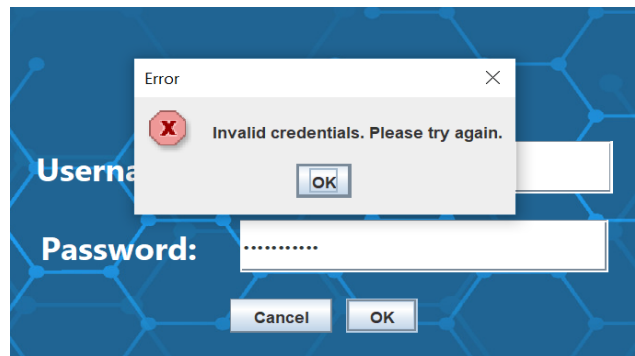


Figure 6. Error Invalid Credentials for Patient

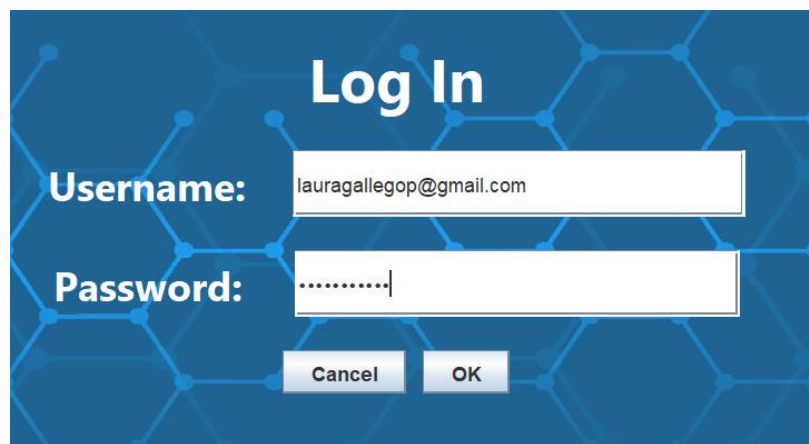


Figure 7. Log in successful for patient

2.4 Patient dashboard

Once logged in, the system provides several features, including viewing personal details, accessing assigned doctor information, starting a monitoring session, reviewing previous reports and feedbacks from doctor, modifying settings, or logging out.

Figure 8. Patient dashboard

2.2.1 View My Information

To view all the personal information, the patient can click on the "View My Information". This action will display the patient's name, DNI, date of Birth, gender and phone number, providing you with quick access to verify your personal information.



Figure 9. View personal information

2.2.2 View Doctor assigned

To see the doctor assigned to the patient, we can click at the "View Doctor Information" button in order to see its assigned name, surname and specialty.

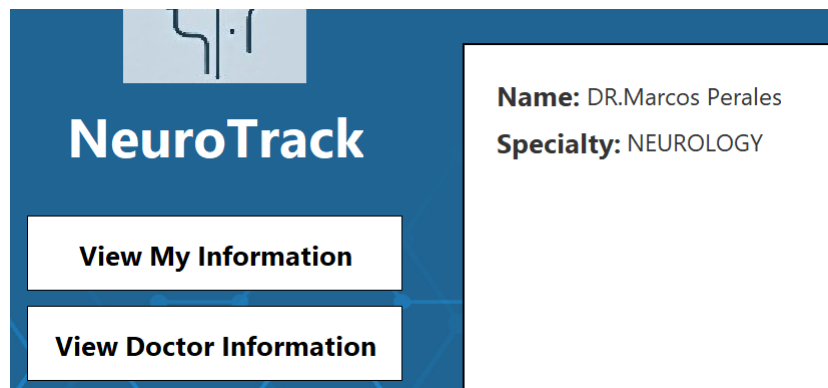


Figure 10. View doctor assigned information

2.2.3 Start Monitoring

To monitor your physiological parameters and report symptoms, select Start Monitoring from the dashboard. The application will display a welcome message before initiating the session. Ensure your BITalino device is connected to the application via Bluetooth to record ECG and EMG signals accurately.

Welcome to your remote Multiple Sclerosis Clinic.
We are now going to attend to your needs.
To make sure we take care of all your needs and report to your doctor,
we would like to ask you to select all the symptoms you are currently experiencing.

Start

Figure 11. Welcome message

2.2.3.1 Indicate Symptoms

The application will ask you to select symptoms you are currently experiencing from a predefined list to report to your doctor.

Select all the symptoms you are currently experiencing:

<input type="checkbox"/> Loss of balance	<input type="checkbox"/> Muscle spasm	<input type="checkbox"/> Numbness or abnormal sensation in any a...
<input type="checkbox"/> Trouble moving arms and legs	<input type="checkbox"/> Difficulty walking	<input type="checkbox"/> Problems with coordination and making s...
<input type="checkbox"/> Tremor in one or both arms or legs	<input type="checkbox"/> Weakness in one or both arms or legs	<input type="checkbox"/> Constipation and stool leakage
<input type="checkbox"/> Difficulty starting to urinate	<input type="checkbox"/> Frequent need to urinate	<input type="checkbox"/> Intense urgency to urinate
<input type="checkbox"/> Urine leakage (incontinence)	<input type="checkbox"/> Facial pain	<input type="checkbox"/> Painful muscle spasms
<input type="checkbox"/> Tingling, itching, or burning sensation in a...	<input type="checkbox"/> Reduced attention span, ability to discern,...	<input type="checkbox"/> Difficulty with reasoning and problem-sol...
<input type="checkbox"/> Depression or feelings of sadness	<input type="checkbox"/> Dizziness or loss of balance	<input type="checkbox"/> Hearing loss
<input type="checkbox"/> Erectile problems	<input type="checkbox"/> Problems with vaginal lubrication	<input type="checkbox"/> Poorly articulated or difficult-to-understa...
<input type="checkbox"/> Trouble chewing and swallowing		

Back Next

Figure 12. Symptoms list

2.2.3.2 EMG Monitoring Instructions

Once you start monitoring, you will first perform an EMG to measure muscle activity. Follow the on-screen instructions carefully to place the electrodes:

- RED electrode: Place on the center of the biceps muscle.
- WHITE electrode: Place 2-3 cm along the muscle, aligned with the muscle fibers.
- BLACK electrode: Place on a bony area such as the elbow or wrist.

After placing the electrodes correctly, press the **"Play"** button to start recording the EMG data.

EMG Instructions

Now we will perform an EMG.

1. Place the **RED** electrode on the center of the biceps muscle.
2. Place the **WHITE** electrode 2–3 cm along the muscle, aligned with fibers.
3. Place the **BLACK** electrode on a bony area like the elbow or wrist.

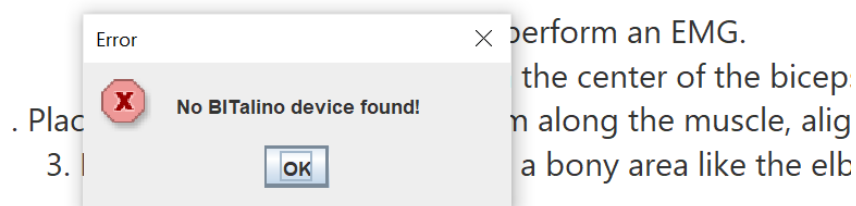
Once everything is ready, press PLAY.

Play

Figure 13. EMG Instructions

If the device is not detected, an error message will notify you. Ensure that the BITalino device is properly connected via Bluetooth and powered on.

EMG Instructions

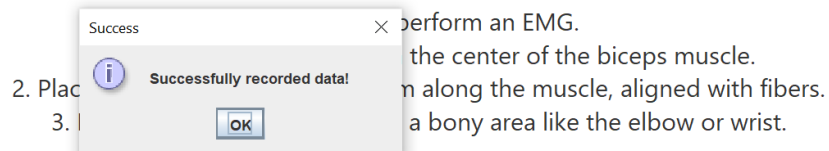


Once everything is ready, press PLAY.

Figure 14. Device is not connected error.

Once the EMG recording is successful, a confirmation message will appear, stating that the data has been recorded successfully.

EMG Instructions



Once everything is ready, press PLAY.

Play

Figure 15. EMG recording successful messages.

2.2.3.3 ECG Monitoring Instructions

After completing the EMG monitoring, you will proceed to record your ECG signals, which track heart activity. Follow the on-screen instructions carefully to place the electrodes:

- RED electrode: Place below the right clavicle.
- WHITE electrode: Place on the lower left side of the torso.
- BLACK electrode: Place on the right side of the torso.

Once the electrodes are placed correctly, press the **"Play"** button to begin the recording.

ECG Instructions

Follow these steps to record an ECG:

1. Place the **RED** electrode below the right clavicle.
2. Place the **WHITE** electrode on the lower left side of the torso.
3. Place the **BLACK** electrode on the right side of the torso.

Once everything is ready, press PLAY



Figure 16. ECG Instructions

If the device is not detected, an error message will notify you. Ensure that the BITalino device is properly connected via Bluetooth and powered on. Once the ECG recording is successful, a confirmation message will appear, stating that the data has been recorded successfully.

Once both EMG and ECG data have been recorded, press the **"Finish Monitoring"** button. The system will automatically upload the recorded physiological data to the server, ensuring secure transmission to your assigned doctor for analysis.

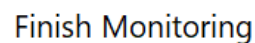


Figure 17. Finish monitoring button

Monitoring Complete
All the information has been sent to your doctor.
A report will be sent to you as soon as possible.
Thank you for your cooperation!

Done

Figure 18. Finish monitoring button

2.4.4. View Feedback

To view the feedback, patients will find a list of feedback messages organized by date. By clicking on a specific date, they can access the detailed feedback provided by their doctor. Each feedback entry displays the name of the doctor, the date of the feedback, and the associated message. This feature allows patients to stay informed about their health progress and receive guidance for further actions or treatment adjustments.

View Feedbacks

Search Feedbacks by Date (YYYY-MM-DD):

Date: 2023-12-01	View Feedback
Date: 2023-11-15	View Feedback
Date: 2023-11-10	View Feedback
Date: 2023-10-25	View Feedback
Date: 2023-10-10	View Feedback

Doctor: Dr. Garcia	Doctor: Dr. Lopez
Date: 2023-12-01	Date: 2023-11-15
Message: Great improvement!	Message: Please schedule a follow-up.

Figure 19. Feedback of the patient

2.4.5 Settings

The settings section of the application provides patients with options to manage their personal information and security preferences efficiently. This section allows users to

update their personal details, this feature ensures that the patient's data remains accurate and up to date for effective communication and monitoring.

Additionally, patients can enhance the security of their accounts by updating their passwords. The patient can input a new password and confirm it. After saving the new password, the system ensures the account's security by preventing unauthorized access.



Figure 20. Settings of the doctor

Name:	<input type="text" value="Laura"/>	New Password:	<input type="password"/>
Surname:	<input type="text" value="Gallego"/>	Confirm Password:	<input type="password"/>
DNI:	<input type="text" value="39511471R"/>		
Birth Date (YYYY-MM-DD):	<input type="text" value="2002-12-20"/>		
Phone:	<input type="text" value="679719921"/>		

Figure 21. Update personal information

Figure 22. Update password

2.4.5 Log out

Finally, when a patient decides to log out of the application, a confirmation dialog appears, this ensures that the decision to log out is intentional, preventing accidental disconnection. Once the action is confirmed, the application securely ends the user's session, protecting the patient's account and ensuring the confidentiality of their data.

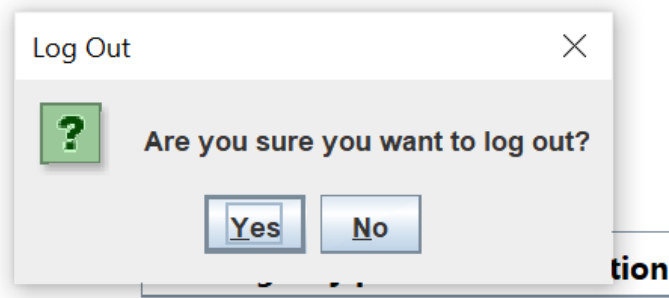


Figure 23. Log out